

# Key GSFC Contributions to the Trans-Pacific Demonstration (TPD)

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J. Patrick Gary  
Pat.Gary@gsfc.nasa.gov  
and  
Paul Lang/Signal Corp  
Paul.A.Lang.1@gsfc.nasa.gov  
and  
Kevin Kranacs  
Kevin.M.Kranacs.1@gsfc.nasa.gov

Earth and Space Data Computing Division/Code 930  
NASA Goddard Space Flight Center

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# Key GSFC Contributions to the TPD

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- Early project formation plans
- Early network infrastructure engineering design plans
- Actual network infrastructure engineering/implementation
  - » Satellite delay simulator at GSFC prior to actual satellite connectivity
  - » Performance Test Script (immediately before VH viewer testing/use)
  - » Implemented and maintained one of the key nodes of the TPD's end-to-end network infrastructure
  - » Identified satellite/terrestrial gateway technology as solution for mitigating long transmission propagation times over geo-synchronous satellites
  - » SkyX Gateways' configuration setup and checkout to achieve maximum end-to-end network throughput performance
- Lessons Learned

# Key GSFC Contributions to the TPD

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- Contributed to early project formation plans
  - » Prepared 1/19/98 Trans-Pacific Digital Library Experiment (TPDLE) Project Plan
  - » Hosted 1/20/98 TPDLE Kickoff meeting at GSFC
    - ~40 attendees including TPD “survivor” reps from GSFC, GWU, and NIH
  - » Created TPDLE Project website at <http://dlt.gsfc.nasa.gov/gibn/>
  - » Hosted 4/28/99 GIBN Trans-Pacific Experiment Working Group Meeting at GSFC
    - ~30 attendees including TPD “survivor” reps from CRL, GSFC, GWU, JPL, NIH, and NREN

# GIBN Trans-Pacific Experiment Working Group Meeting

## April 28, 1999 at GSFC

### Agenda

- Intros	All	5 minutes
- Summary of the Trans-Pacific Experiment Applications		
- Visible Human	Mike Gill/NLM	15 minutes
- Astronomy	Eddie Hsu/JPL	15 minutes
- Summary of US network plans	Neil Helm/GWU	10 minutes
- Summary of Japan network plans	Naoto Kadawaki/CRL	10 minutes
- Network/application performance measurement plans	All	60 minutes
- Wrap up		5 minutes

# Key GSFC Contributions to the TPD

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- Contributed to early network infrastructure engineering design plans
  - » Initial data communications infrastructure and network protocol concepts summarized in Pat Gary's presentation (<http://dlt.gsfc.nasa.gov/gibn/garypres1.html>) at 1/20/98 TPDLE Kickoff meeting at GSFC
  - » Kevin Kranacs' and Paul Lang's "GIBN Trans-Pacific Demonstrations Application Test Plan for the Visible Human Viewer" presented 11/9/99 at JUSTSAP 1999's Satellite Communications Workshop
    - Created satellite delay simulator at GSFC prior to actual satellite connectivity
    - Created performance test script for characterization of the network immediately before VH viewer testing/use

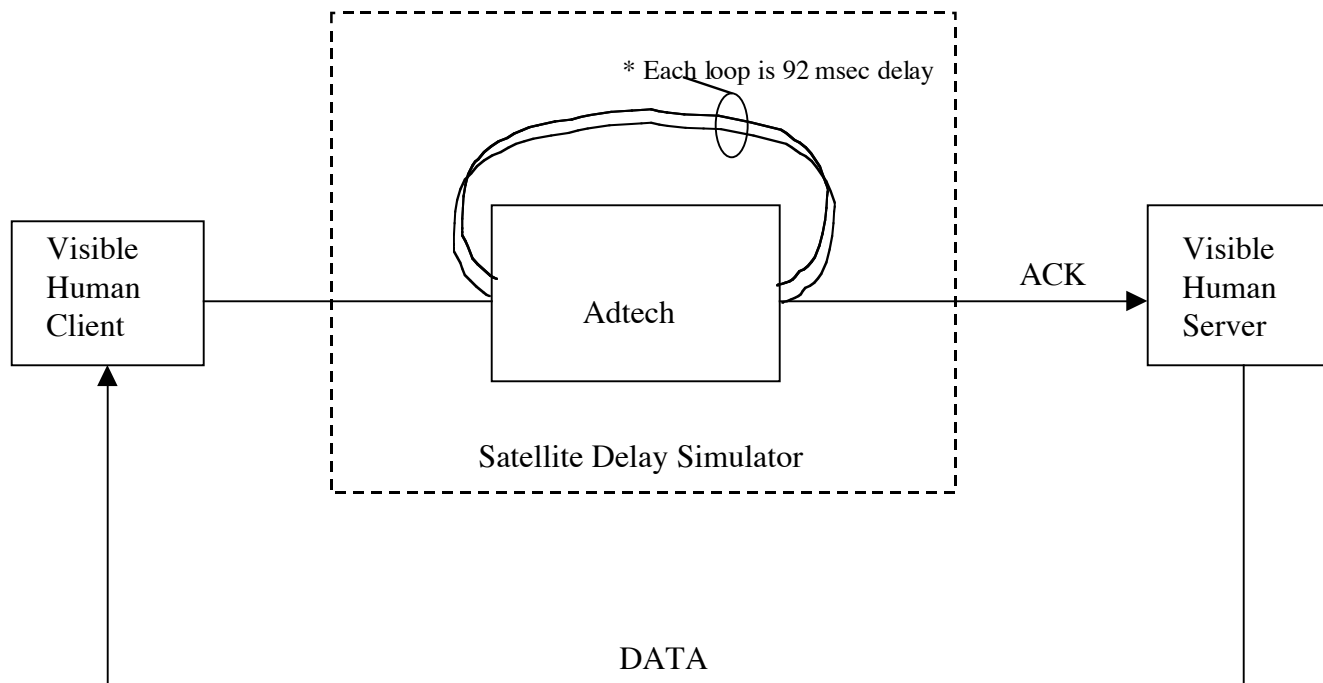
# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation
  - » Satellite delay simulator at GSFC prior to actual satellite connectivity
    - PVC connections between NLM and each of NLM, GSFC, ARC (including loop through Adtech simulator at GSFC back to NLM) to create a simulated two satellite environment
    - Generated test measurements providing a comparison of end-to-end network throughput performance between terrestrial and satellite connectivity

# Satellite Delay Simulator

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\* need 12 passes (11 loops) to simulate the delay in a two hop satellite connection (1.1 second delay)

# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation (continued)
  - » Performance Test Script (immediately before VH viewer testing/use)
    - An interactive script that logged results to a time-date stamped file
      - Ping with different MTU sizes
      - Bi-directional traceroute to verify path
      - Netperf a windows network performance tool (later replaced with TTCP as platform changed from WindowsNT to MacOSX UNIX)
      - Fixed file ftp
      - Fixed file NFS copy tests (later replaced by TCP socket copy tests when file transfer format was changed to Personal File System)



# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation (continued)
  - » Implemented and maintained one of the key nodes of the TPD's end-to-end network infrastructure
    - Linkage between NIH(VH) and UMD(RA) application end user sites and NREN
    - Created PVC connections for both terrestrial and satellite connectivity
    - Provided effective troubleshooting for a broad range of network problems

# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation (continued)
  - » Identified satellite/terrestrial gateway technology, such as Mentat's SkyX Gateway product, as next best solution for mitigating long transmission propagation times when communicating via geo-synchronous satellites, once it was determined that many key VH end user computers did not support TCP extended windows
  - » Asked Mentat to become new TPD partner
    - Resulted in three Mentat SkyX Gateways deployed, one at each of CRL, GSFC, and SMU

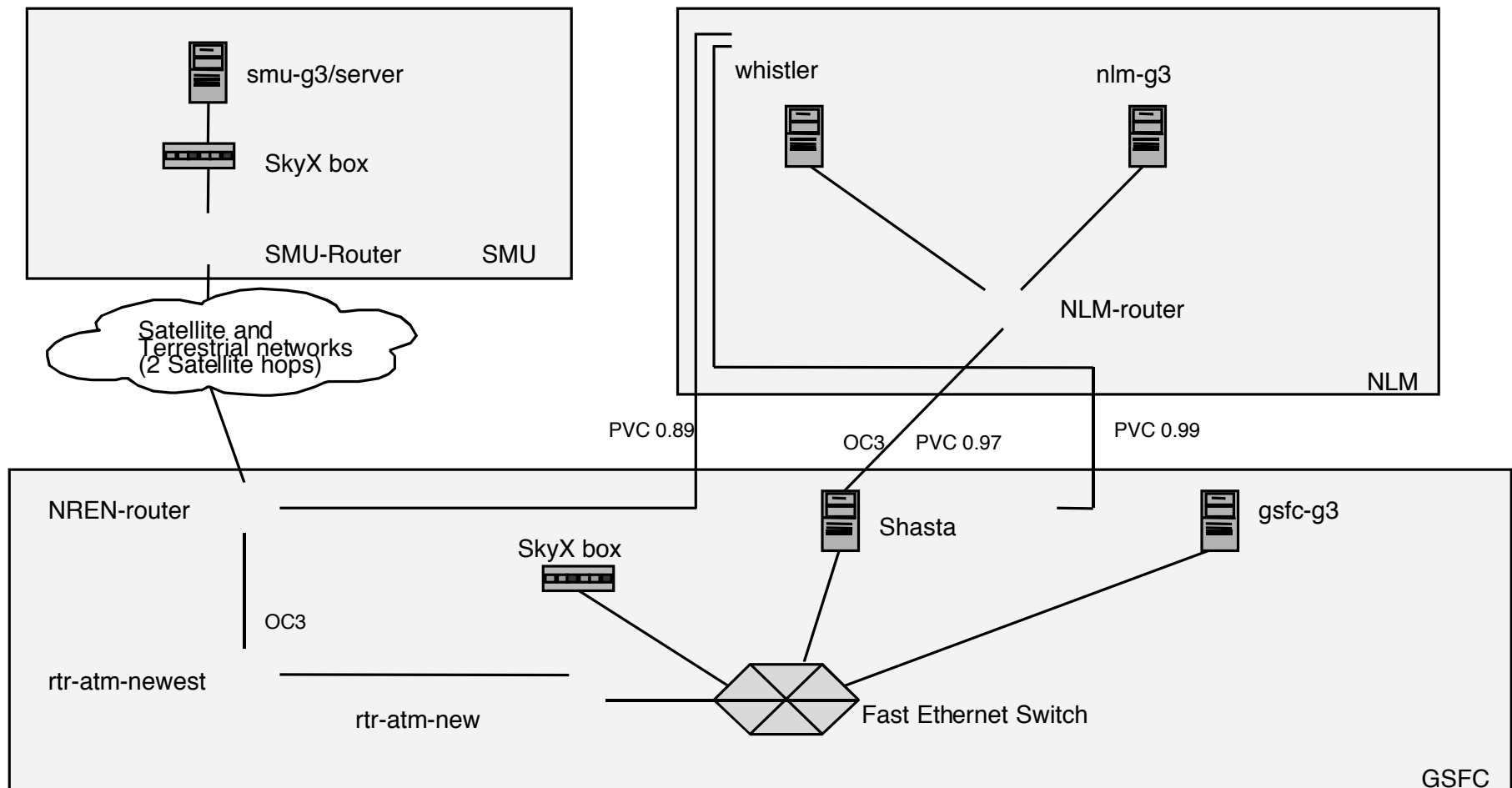
# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation (continued)
  - » Significantly involved in SkyX Gateways' configuration setup and checkout to achieve maximum end-to-end network throughput performance
  - » Generated test measurements providing a comparison of end-to-end network throughput performance with and without SkyX Gateway connectivity

# Key GSFC Contributions to the TPD

## SkyX Gateway Network Configuration for VH testing



# Key GSFC Contributions to the TPD

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- Contributed to actual network infrastructure engineering/implementation (continued)
  - » Results from Performance Test Script

## Simulated Satellite:

Path	Via	SkyX Proc	RTT (ms) 65B/1500B	#Hops -> <-	ftp (Mbps) 15KB/32KB	nttcp (Mbps) 7MB
ARC-NLM	Simulated	No	1171/1172	2/2	.027/.155	0.203

## Actual testing:

Path	Via	SkyX Proc	RTT (ms) 65B/1500B	#Hops -> <-	ftp (Mbps) 15KB/7MB	nttcp (Mbps) 7MB
SMU-GSFC	Intelsat	Yes	1124/1127	14/14	/15.2	11.9
SMU-NLM	Intelsat	Yes	1127/1130	16/16	10.9/15.2	11.9
SMU-NLM	Intelsat	No	1127/1130	16/16	.026/.224	0.225
SMU-GSFC	TransPAC	No	191/224	16/14	/.817	0.732

# Key GSFC Contributions to the TPD

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- Contributed to Lessons Learned
  - » Paul Lang's 8/4/00 email to Ray Gilstrap
  - » Paul Lang's pre-10/16/00 emails to Richard desJardins
- Other contributions
  - » Use of GSFC-sponsored ATDnet network links connecting NIH(VH) and UMD(RA) to GSFC
  - » Use of GSFC High End Computer Network switches/routers (~\$1M)
  - » Reviews/critiques/edits of some TPD publication material
  - » Participated in most TPD planning and network debug telecons